

THESIS

NEGATIVE EMOTIONALITY, SELF-REGULATION BEHAVIORS, AND THE TEACHER-
CHILD RELATIONSHIP IN PRESCHOOL CLASSROOMS

Submitted by

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ABSTRACT

NEGATIVE EMOTIONALITY, SELF-REGULATION BEHAVIORS, AND THE TEACHER-CHILD RELATIONSHIP IN PRESCHOOL CLASSROOMS

This study examines the relationship between levels of negative emotionality, quality of the teacher-child relationship, and self-regulation behaviors in preschool children ages 2.5-5 years ($N= 67$). It was expected that children with high levels of negative emotionality who experienced a close teacher-child relationship would have higher levels of self-regulation as compared to children with high negative emotionality who had a teacher-child relationship marked with distance or conflict. Negative emotionality and parentally reported self-regulation were assessed using the Child Behavior Questionnaire, teacher-child relationship was measured using the Student-Teacher Relationship Scale, and self-regulation behavior was observed using the Preschool Self -Regulation Assessment. Results were not supportive of the predicted relations among negative affect, student-teacher relationship, and self-regulation. Implications are discussed.

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Introduction

Scholars have recently become more interested in the development of social and emotional skills in early childhood. With legislation like the No Child Left Behind Act, and a growing number of children entering formal education unprepared, both researchers and policy makers are focused on this issue (Rhoades, Warren, Domitrovich, and Greenberg, 2010). As understanding of social and emotional development in early childhood continues to grow, so do questions about the process by which independent factors influence one another to affect individual variation in levels of social and emotional competence (Skibbe, McDonald Connor, Morrison, and Jewkes, 2011). Three important factors that have been identified as playing a role in this development are self-regulation behaviors (Vallotton and Ayoub, 2010), emotionality (Denham, 2006), and the teacher-child relationship (Birch and Ladd, 1997). The period of early childhood is a critical time in the development of self-regulation behaviors as well as social and emotional competencies, as these processes develop a great deal during this period. This study examined the relationship between levels of emotionality and self-regulation behaviors, and whether or not the teacher-child relationship acted as a moderator in this association.

Self-Regulation Behaviors

Self-regulation has long been thought of as an essential tool for children to succeed within a classroom setting in both academic and socio-emotional areas. Definitions of self-regulation vary throughout the literature and can focus on different types of regulatory processes depending on the context in which self-regulation is anchored and the emphasis of the particular researcher. For example, according to Calkins and Williford (2009), self-regulation can be thought of as individuals' capacity to manage their behaviors and emotions appropriately in a

given context. In contrast, Blair and Diamond (2008 p. 900) defined regulation as “the process through which one system modulates or governs the reactivity of another system”.

Although definitions of self-regulation and the domains included in these definitions vary, in this study I will focus on aspects of regulation typically deemed most pertinent to functioning in a classroom setting. These involve primarily the ability to hold a goal or rule in mind and to inhibit behavior so as to follow the rule or achieve the goal (Calkins and Marcovitch, 2010). One may need to inhibit behavior for a variety of reasons, which will be sampled in the self-regulation assessment that will be used in the present study. Specific tasks will require inhibiting irrelevant information, undesirable behaviors, desired activities that are contrary to a rule, and so on. These forms of self-regulation have been variously labeled as “executive functions” and “effortful control”, with much overlap between these constructs (Eisenberg, Valiente, & Eggum 2010).

Executive functions (EF) include a set of cognitive skills utilized in problem solving and goal-directed behavior, which include processes such as attention, inhibitory control, and memory (Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009; Calkins and Marcovitch, 2010; Hughes and Ensor, 2005). This broad view of EF includes both purely cognitive regulation and more motivationally or emotionally significant regulation, which some scholars argue should be distinguished as two separate types of EF. Zelazo & Muller (2002), for example, propose EF should be thought of as two distinct, but overlapping types, where ‘hot’ EF is the emotional or motivational aspect of EF processes (EF in the face of strong emotion elicitors) and ‘cool’ EF is the cognitive side (EF under less emotion-laden conditions). Effortful control, which is defined as “the efficiency of executive attention- including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors” (Rothbart and Bates,

2006 p.129), has enormous overlap with EF, but these literatures are relatively separate.

Regardless of how one labels these processes, scholars point to the importance of self-regulation in school success due to the regulatory processes needed to remain focused in school and the empirical association of self-regulation with positive school outcomes (Blair, 2002).

There is ample evidence that self-regulation behaviors contribute to success in both academic and social arenas. Children with high levels of self-regulation are shown to perform better academically, are more engaged in classroom activities, are more likely to have positive relationships with teachers and peers, and experience fewer adjustment problems in the transition to kindergarten (Calkins and Williford, 2009; Eisenberg, Valiente, Eggum 2010; Raver et al., 2011; Valiente, Lemery-Chalfant, Swanson and Reiser, 2008). Well-developed regulatory capacities enable students to direct and sustain their attention during academic tasks, control behaviors in an appropriate manner, and engage with individuals in their school environment in an appropriate way. Conversely, children with low levels of self-regulation experience more difficulties in academic tasks, peer relations, and school adjustment (Blair, 2002; Calkins and Williford, 2009; Eisenberg et al., 2010).

Self-regulation involves regulation of a variety of different domains of behavior, including emotion. Although emotion regulation may be viewed as encompassing, but going well beyond the types of self-regulatory processes on which the proposed study will focus (e.g., see Barrett, in press), the behavioral measures of self-regulation in this study include both “hot” and “cool” EF tasks, and one major domain of behavior that will need to be regulated on the “hot” EF tasks will be emotion. It is important to study emotion regulation as a domain of self-regulation in this study, both because the focus is on self-regulation in children with high

negative emotionality and because emotion regulation, as a key emotional competency, is an important factor in school readiness.

Although we will study emotionality separately from emotion regulation, in actuality, the two cannot be completely distinguished. According to the functionalist perspective on emotions, all emotions, including negative emotions, serve important regulatory functions for the individual. Emotions result from a specific relationship between the internal or external environment and the individual's ongoing and/or long-term needs, concerns, and/or goals, and they promote intrinsic regulatory processes to address these concerns, needs, or goals, and, by doing so, to regulate the emotional state (e.g., Barrett, in press). For example, anger energizes behavior to overcome obstacles, communicates to others that the person feels thwarted or wronged, and promotes cognitive focus on the barrier to goals that elicited the anger.

However, young children need to learn appropriate ways of responding to their emotions that do not harm themselves, others, or objects and do not interfere with other important activities in which they should be engaging, and often this necessitates extrinsic regulation *of* emotion. Emotion regulation entails volitional and non-volitional processes, both intrinsic to the emotion and extrinsic to it, that modulate, promote, or otherwise control or alter an ongoing emotion process (see Barrett, 1998; Barrett, in press). Executive Functions would usually be limited to volitional regulatory processes, so they overlap with volitional emotion regulation when applied to regulation of emotional processes.

Emotional competence, which is comprised of a child's emotion regulation and emotion knowledge, among other skills (Denham, 2006) has been found to play an important role in early school success and adjustment in the preschool classroom (Eisenberg et al., 2010). Children who have difficulty regulating their emotional reactions, in particular, are likely to have difficulty in a

classroom setting due to the wide array of emotion-inducing stimuli present on a day to day basis, and the need to remain focused on goal-oriented school activities despite these potentially distracting stimuli (Calkins and Marcovitch, 2010).

Recent research has documented that early childhood is a period of rapid growth and development in self-regulatory behaviors, including regulation of one's emotional states (Calkins and Williford, 2009; Calkins and Marcovitch, 2010). Self-regulation skills improve and become more purposeful in children as the pre-frontal cortex area of the brain matures beginning in early childhood (Blair, 2002; Espy and Bull, 2005). A study conducted by Zelazo and Boseovski (2001) indicated a marked increase in skills associated with executive functioning in children between 3 and 5 years of age. Similar growth in emotion regulation is seen starting in toddlerhood and development continues throughout the early childhood years and beyond (Cole, Armstrong, and Pemberton, 2010).

The dramatic growth of self-regulatory and emotion regulatory competencies in early childhood highlights the potential importance of the preschool classroom as a facilitator in the development of these skills. As alluded to earlier, children are bombarded daily by a multitude of emotionally arousing situations in a preschool classroom. These events provide an opportunity for children to learn appropriate ways to manage their emotional reactions and behaviors as modeled by teachers and their peers (Raver, Garner, and Smith-Donald, 2007). The preschool classroom also serves as an environment where children can practice utilizing newly developed regulation and emotion regulation skills in order for such responses to eventually become automatic in nature, requiring less cognition and attention from the child (Calkins and Marcovitch, 2010). An increase in the number of demands placed on children's behavior also takes place within the classroom setting, and for many children this is the first experience they

have with directives such as standing in line and waiting quietly until called on to speak (Skibbe et al., 2011). In addition, the development of self-regulation is influenced by the environment and certain experiences can foster growth in regulatory skills by way of the pre-frontal cortex. The preschool classroom can provide experiences that build neural connections in areas associated with higher-order cognitive processes that support self-regulation. Parts of the brain responsible for higher-order cognitive processes continue to be malleable for many years after development first begins (Blair, 2002; Blair and Diamond, 2008; Calkins and Williford, 2009).

Negative Emotionality

The present study will examine the role of negative emotionality in self-regulation. It is natural and expectable for negative emotion to be elicited in the preschool classroom. Moreover, negative emotions are not intrinsically maladaptive in that they promote behaviors that are functional with respect to the issues with which the emotion is concerned, as indicated earlier. Researchers and theorists in emotional development have highlighted the difficulty in distinguishing emotionality from emotion regulation (e.g., Campos, Frankel, & Camras (2004); Cole, Martin, & Dennis, 2004). Part of this is a measurement issue; if one observes a high level of emotionality, this may be due to a stronger emotional reaction to the stimuli, poor skill at down-regulating the emotionality, or both. If one observes a low level of emotionality, this may be due to a strong ability to down-regulate emotion, over-regulation of emotion, low reactivity to the emotion-inducing stimuli, or some combination of these. Moreover, given that intrinsic regulatory processes are a part of emotion processes; emotions promote behaviors and thoughts that regulate (e.g., Barrett, in press; Campos et al., 2004; Thompson and Meyer, 2007). Thus, many argue that some purported regulatory processes actually are reflective of emotionality, and unusually high levels of emotionality often may be reflective of under-regulation.

For the purposes of clarity, however, most researchers and theorists believe it is useful to distinguish emotional responsiveness from emotion regulation because clearly some emotion regulation processes are executed purposefully in order to regulate emotions (e.g., Thompson & Meyer, 2007). Further, emotion regulation is a skill that can be taught and developed. Thus, this study will distinguish negative emotionality from regulation of negative emotion, while acknowledging the important overlap between these constructs.

Emotionality, which can be thought of as the reactive side of emotions, generally refers to the magnitude of an emotional reaction and how easily an emotional response is elicited (Rydell, Berlin, and Bohlin, 2003). Children who manifest strong reactions to emotional stimuli are more likely to perform lower on academic tasks in early elementary school and face an increased risk of dropping out of school (Raver et al., 2007). Children who manifest lesser intensity of emotionality, on the other hand, are liked better by teachers and classmates, exhibit better school functioning and adjustment, and are better able to focus on school tasks (Calkins and Williford, 2009). These studies provide critical evidence that point to the intensity of the emotional reaction, as opposed to how easily an emotional reaction is elicited, as the factor associated with determining whether negative emotion is detrimental or helpful in a preschool classroom setting.

Levels of high-intensity negative affect appear to be detrimental in a classroom setting, with both direct and indirect associations found between high negative emotionality and socio-emotional difficulties (Calkins and Marcovitch, 2010). Children who exhibit high intensity negative emotion in reaction to anger-evoking situations are consistently shown to have higher levels of aggression (Eisenberg et al., 1993), and aggression is linked to higher rates of peer exclusion and rejection in the classroom (Denham, 2006). High levels of aggressive behaviors are often stable across time and are associated with increased risk of persistent difficulties in peer

relationships and teacher-child relationships into the early elementary school years (Ladd and Burgess, 1999). High intensity negative emotionality is also linked to problems focusing on and remembering information, as well the speed and accuracy with which children complete novel academic tasks (Blair, 2002; Denham, 2006; Raver et al., 2007). Even after controlling for cognition, high levels of negative emotional arousal were significantly associated with lower academic achievement (Raver et al., 2007), further indicating the importance of adequate emotional competence for positive academic trajectories. Although most research on emotion in the classroom focuses on levels of negative emotionality, Rydell et al. (2003) found that intense positive emotionality (exuberance) was also predictive of problem behavior in early elementary school, raising the question of whether the most important issue is difficulties with strong emotion, rather than negative emotionality, specifically. Although the focus of the present study will be on negative emotionality, the potential impact of intense positive emotionality deserves study as well.

Blair (2002) proposes a link between levels of emotionality and self-regulatory cognitive processes in young children. Although the association of emotionality and self-regulation has been identified and supported in adults, there has been very little consideration for how emotionality impacts the growth of self-regulation in early childhood. This relationship may be especially important to study in young children given that volitional self-regulatory processes are just beginning to develop during this period (Raver et al., 2007). Further, areas of the brain associated with emotionality develop much earlier than areas responsible for self-regulation, which poses the question as to whether or not an individual's emotionality directly influences the development of self-regulatory processes in early childhood, with lasting impact on brain development. These findings highlight the preschool years as a crucial time to focus empirical

research in order to fully understand how emotionality impacts school and social success and what pathways are utilized to improve deficiencies in these areas.

It is important to note that although high intensity levels of emotionality are associated with negative outcomes, typically, these outcomes seem to be mediated or moderated by the relation between high emotionality and other negative characteristics, such as low emotion regulation (Rydell et al., 2003) or aggression (Denham, 2006; Ladd and Burgess, 1999). Within the preschool classroom, the problematic trajectories associated with high levels of intense negative emotionality may be due to the inability of the child to engage in appropriate behavioral actions in response to emotion-inducing stimuli within their environment. Modeling of adaptive responses to emotion by individuals within a preschooler's environment, such as their teachers, may help children better handle emotion-inducing situations. Take for example, a child who exhibits high levels of intense negative emotionality. If the child is able to establish a close relationship with his or her preschool teacher, the child is likely to spend more time engaging with the teacher which would provide a greater number of opportunities to watch the teacher modeling appropriate emotional behavior. In addition, the child will have more opportunity to engage in guided appropriate emotional behavior with the help of his or her classroom teacher. Thus, it seems likely that children who form close relationships with teachers who serve as role models may learn to regulate intense negative emotions and to engage in more adaptive behaviors when experiencing strong negative emotion.

Teacher-Child Relationship

As interest in the development of social and emotional competence in early childhood increases, the role of social relationships within the classroom became a central focus of research. Among relationships within the classroom, the teacher-child relationship has been

identified as an important variable in a number of academic and socio-emotional outcomes as well as levels of school readiness (Justice, Cottone, Mashburn, & Rimm-Kaufman, 2008). Research indicates that positive teacher-child relationships are linked to higher levels of engagement and participation in classroom activities, higher rates of academic achievement, and higher levels of school readiness as compared to those children with distant or conflicted teacher-child relationships (Birch and Ladd, 1997; Palermo, Hanish, Martin, Fabes, & Reiser, 2007; Valiente et al., 2008). On the other hand, teacher-child relationships marked by high levels of conflict or distance are linked to lower academic achievement and school adjustment, more behavioral problems and higher rates of peer exclusion (Baker, 2006; Birch and Ladd, 1997; Justice et al., 2008).

The student-teacher relationship has also been linked to facets of self-regulation behaviors in preschool classrooms as well as elementary school years (Birch and Ladd, 1997; Ocak, 2010). Children with low levels of effortful control are far more likely to experience teacher-child relationships marked by conflict and distance as compared to their peers with high levels of effortful control (Eisenberg et al., 2010). In addition, children with a teacher-child relationship categorized as close are shown to have a greater number of solutions when engaging in a novel problem-solving activity, which requires skills typically subsumed under executive functioning (Ocak, 2010). In a study conducted by Valiente et al. (2008), the authors found that the positive association between levels of effortful control and grade point average in elementary school children was partially mediated by the teacher-child relationship. One possible explanation for this association is that children with lower levels of effortful control receive less attention and support from their classroom teachers, causing them to miss out on opportunities to develop academically (Valiente et al., 2008).

One could hypothesize a bi-directional relation between teacher-child relationships and self-regulation, based on this explanation. Self-regulation is believed to develop in the context of relationships with others who help the child in regulating his or her behavior (Agina, Kommers, & Steehouder, 2011). The internalization of others' methods of regulating behavior, as well as their values that serve as a basis for self-regulation, allows children to become more self-regulated and to work independently in both academic and social domains (Calkins and Williford, 2009). Consistent with the idea that such processes occur in the teacher-child relationship, Birch and Ladd (1997) found that children rated as having a close teacher-child relationship were rated higher by their teachers in measures of self-directedness, which reflected the degree of self-directed and independent behavior shown by the children in the classroom.

The impact of quality teacher-child relationships may be of added importance in children with behavior problems. Research has shown that quality teacher-child relationships can act as a protective factor for those children who display high levels of anti-social behaviors, with children who have a close teacher-child relationship experiencing better adjustment to school as compared to children who exhibit anti-social behavior and have a negative teacher-child relationship (Baker, 2006). In addition, the teacher-child relationship is shown to be of added importance to those children who have less secure attachments to their mothers. In a study conducted by Buyse, Verschueren and Doumen (2009), scholars observed a link between children with insecure attachment and a close teacher-child relationship. Previously, children with insecure attachments were observed to be at higher risk for aggressive behaviors in the preschool classroom. Buyse, Verschueren, and Doumen (2009) found that children with insecure attachments, who were also able to develop a close teacher-child relationship, were no longer at higher risk for aggressive behaviors exhibited in the classroom in kindergarten.

Although the moderating impact of a close teacher-child relationship on social and behavioral outcomes has been found in at-risk elementary school children, there has been little research done on this same moderating relationship in younger children in the preschool classroom (Baker, 2006).

The relations among self-regulation behaviors, negative emotionality, and the teacher-child relationship in preschool children are important to clarify due to the association each individual factor has with rates of school readiness during the transition to kindergarten as well as academic and socio-emotional outcomes into middle childhood (Ladd and Burgess, 1999; Valiente et al., 2008). Emotionality in the preschool classroom has only recently been identified as an important factor in school success, and much more information about emotionality in the preschool classroom is needed in order to fully understand the impact of emotional difficulties in this context (Fantuzzo et al., 2007). Further, mechanisms by which self-regulation behaviors may be improved are of added importance due to the multitude of negative outcomes associated with deficiencies in these processes (Blair and Diamond, 2008).

The current study examines the relationship between levels of negative emotionality and self-regulation behaviors in preschool children and whether the teacher-child relationship has a moderating effect on this association. Specific hypothesis for the study are depicted below in Figure 1 and are as follows 1) children with high levels of negative emotionality have lower levels of self-regulation behaviors, and 2) the teacher-child relationship moderates this association. It is expected that children with high levels of negative emotionality who experience a close teacher-child relationship will have higher levels of self-regulation as compared to children with high negative emotionality who have a teacher-child relationship

marked with distance or conflict. An illustration of both hypotheses in this study can be seen in Figure 1.

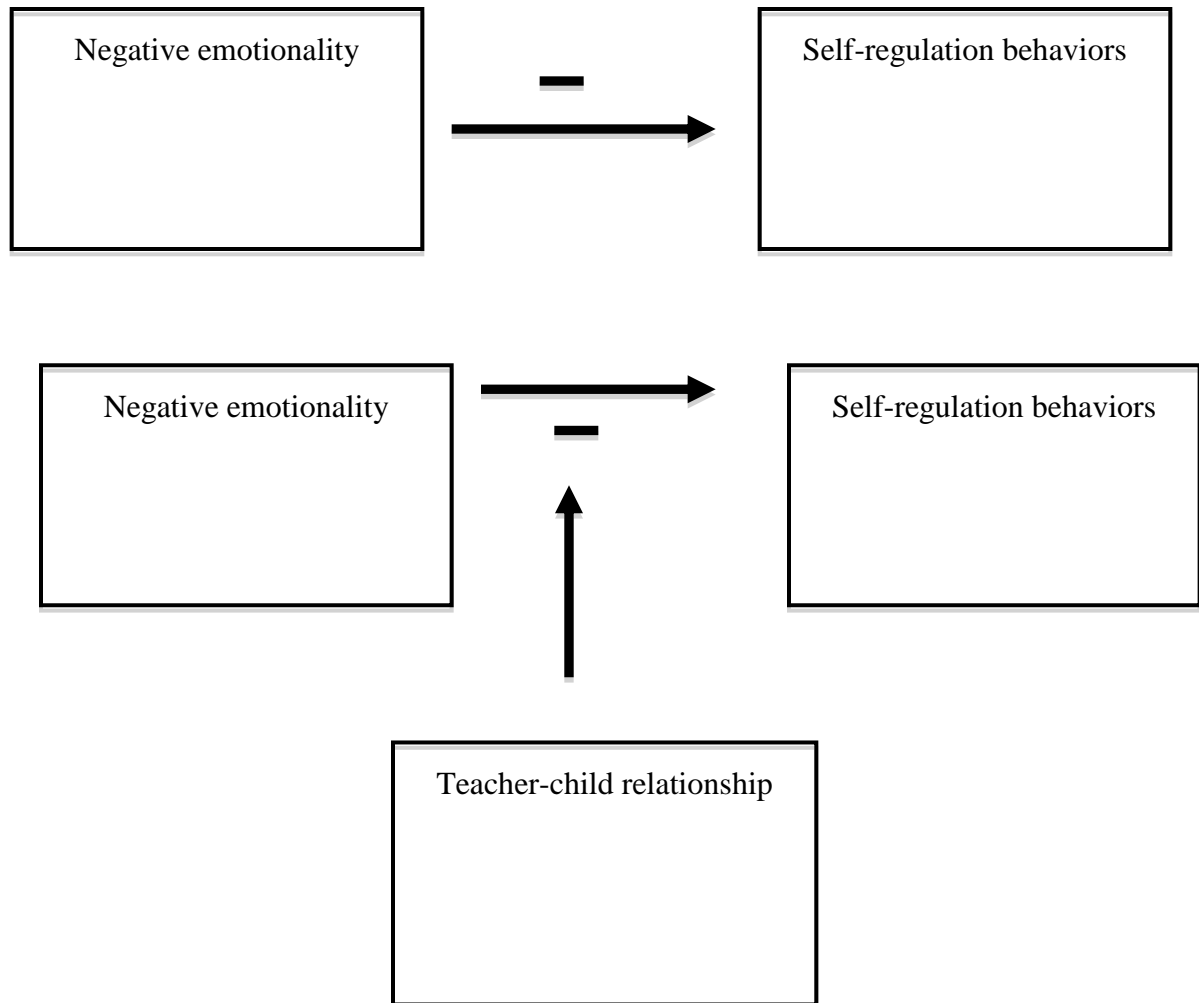


Figure 1 *Proposed Hypotheses*

Method

Sample

The study sample consisted of children 2.5 to 5 years of age. The total number of participants was 67, with 36 participants were recruited for the study from the Colorado State University

Early Childhood Center, and 31 from The Teaching Tree, a non-profit center serving a large number of low-income families. These two sites were chosen to ensure a wide range of socioeconomic status and ethnic background. Although 67 children were included in one or more analyses, as will be specified later, Ns varied greatly by measure because of missing data. Approximately 55.2% of participants were female, and the majority of the sample was Caucasian (75.4%). The sample consisted of 7% Hispanic participants, 1.8% Asian, and 14.0% were of mixed ethnicity. These two sites were chosen to ensure a wide range of socioeconomic status and ethnic background.

Measures

Emotional reactivity. Measures of emotional reactivity were obtained from primary caregivers of participants using the Child Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hersey, & Fisher, 2001). The CBQ short form is a widely used 94-item parent-report temperament questionnaire. Parents were asked to indicate how their child would react to a variety of statements such as “has temper tantrums when he/she doesn’t get what he/she wants”, “tends to become sad if the family’s plans don’t work out,” “will move from one task to another without completing any of them”, “is afraid of loud noises”, and “becomes very excited before an outing (e.g., picnic, party)” using a scale ranging from 1 (*extremely untrue of the child*) to 7 (*extremely true of the child*). There are 14 subscales: Activity level, Anger/frustration, Approach/Positive anticipation, Attentional control, Discomfort, Falling reactivity/Soothability, Fear, High intensity pleasure, Impulsivity, Inhibitory control, Low intensity pleasure, Sadness, Shyness, and Smiling/laughter. In addition, many researchers have used 3 domain scores: negative affectivity, extraversion, and effortful control. For the purposes of this study, the 94-item version was used to assess these 3 domains, and negative affectivity was used as a measure

of negative emotionality and effortful control was used as a parent-report measure of self-regulation (to provide validity for the self-regulation behavioral assessment, described shortly). The domain score for negative affectivity was an aggregate of anger, fear, sadness, discomfort, and soothability (reversed), based on a factor analysis conducted by Putnam and Rothbart (2006). The domain score of effortful control, based on the same factor analysis, is composed of inhibitory control, attention, low intensity pleasure, and perceptual sensitivity (Putnam and Rothbart, 2006). The sample size for CBQ data in this study is $N = 32$, as many participant families did not complete the CBQ short form. . The short version shows marginally adequate to high reliability in children ages 3 to 7, with Cronbach's alpha in the current study yielding internal consistency reliabilities of $\alpha = .850$ for the negative emotionality subscale and $\alpha = .580$ for the subscale of effortful control. The subscales of anger, discomfort, fear, sadness, and soothability (reversed) were aggregated to create the negative emotionality variable. The variable of effortful control is comprised of attention, inhibitory control, low intensity pleasure, and perceptual sensitivity subscales. As indicated later, however, although effortful control has been found to only have marginally adequate reliability, it was significantly correlated with the behavioral measure of self-regulation, suggesting that it was sufficiently reliable to provide meaningful results.

Teacher-child relationship. Teachers completed the Student Teacher Relationship Scale (STRS; Pianta, 2001), which is the most widely used assessment for teacher-reported relationship quality with individual students. The measure is comprised of statements such as "This child openly shares his/her feelings with me" where teachers rate on a scale from 1 (*definitely does not apply*) to 5 (*definitely applies*). Scores indicate the teacher's perceptions of levels of conflict and closeness within the teacher-child relationship. The STRS has reported

internal consistency reliability of $\alpha = .87$, with the closeness scale yielding $\alpha = .80$ and the conflict subscale at $\alpha = .86$ (Baker, 2006). In addition, predictive validity has been shown for the STRS in terms of social competence and academic achievement in children from early childhood into later elementary school (Pianta, 2001). The sample size for STRS in this study is $N = 62$. Cronbach's alpha for the STRS data collected in the current study is $\alpha = .793$ for the closeness subscale, and $\alpha = .874$ for the conflict subscale.

Self-regulatory behaviors. Observers obtained indicators of self-regulation in participants by conducting the Preschool Self-Regulation Assessment (PSRA; Smith-Donald et al., 2007). The PSRA is a battery of 10 tasks developed to measure levels of effortful control, executive control, and compliance. Each individual task, a description of the task, and the construct being measured are listed in Table 1. For the purposes of this study, data obtained from the PSRA assessment were used to create scores for "Hot" executive function (EF) and "Cool" EF. The PSRA was shown to have moderate to high construct validity as well as concurrent validity in children ages 2.5- 5 years (Smith-Donald, Raver, Hayes, & Richardson, 2007). In the current study the PSRA measure of hot EF yielded internal consistency reliability of $\alpha = .634$, and the cool EF subscale showed internal consistency reliability of $\alpha = .512$. Although this latter alpha is only a marginally adequate level of reliability, there were only 3 items, which typically is associated with somewhat lower reliability. The sample size for the PSRA in this study is $N = 49$.

Table 1

PSRA Behavioral Assessment Tasks

Task	Description	Construct Measured
Balance Beam	Child directed to walk slowly along a line	“Cool” EF
Pencil Tap	Child asked to tap pencil twice when researcher taps once, and child taps once when researcher taps twice	“Cool” EF
Tower Task	Child instructed to take turns with assessor in using blocks to build a tower	“Cool” EF
Tower Cleanup	Child asked to pick up blocks from Tower Task	Compliance
Toy Sorting	Child instructed to sort a mix of toys and put them in their correct place but told not to play with the toys	Compliance
Toy Wrap	Child directed to look away while researcher loudly wraps a “present”	Emotion Regulation/ “Hot” EF
Toy Wait	Child told to wait and not touch the “present”	Emotion Regulation
Toy Return	Child instructed to give up a fun toy after short time of playing with the toy	Compliance/Emotion Regulation/ “Hot” EF
Snack Delay	Child told to wait until researcher gives the okay to take the M&M from under a clear cup	Emotion Regulation/ “Hot” EF
Tongue Task	Child & researcher place an M&M on their tongue and must wait to see who will eat it first	Emotion Regulation/ “Hot” EF

Procedure

This study is an addition in the ongoing Pyramid Project study currently being conducted by Karen Barrett; however, only centers already implementing the Pyramid model will be a part of the study, and effectiveness of Pyramid will not be a focus of the present study. Detailed

letters informing caregivers about this study, as an addition to the Pyramid Project, were sent home to all children enrolled in both early childhood facilities starting in the fall semester. Letters of consent were included in the information each family was given and those wishing to participate returned signed consent forms accordingly. Staff at both childcare facilities were given letters informing them of this study as well as letters of consent to participate. In addition, before conducting the behavioral assessment, graduate research assistants obtained assent from participating children.

Consenting families were assigned identification numbers and this number was the only identifying factor used when analyzing data. The spreadsheet that links participants names and contact information with their ID numbers is kept in a locked folder on a computer only accessible by the research team. Incentives for participation were included for caregivers of participating children as well as the staff at the childcare center. Parents who participate will have their name entered in a drawing for a gift card to a local spa. Staff at both childcare facilities were entered into a raffle for a \$25 gift card as incentive for completing questionnaires.

This study utilizes a correlational design, where participants were studied naturalistically in their classrooms as designated by each separate childcare facility. Lead classroom teachers completed measures assessing the teacher-child relationship with consenting children during the end of the spring semester. This ensured that lead teachers knew the children well enough to provide accurate ratings. Questionnaires were sent home to caregivers of participants, who were asked to complete the short form version of the Child Behavior Questionnaire regarding their preschool child. During this time, graduate research assistants were taking consented children out of the classroom individually to conduct behavioral tasks to assess regulatory behavior skills. The graduate research assistant was familiar with the behavioral measurement and trained in

conducting assessments with children. In addition, one individual graduate researcher conducted all the behavioral assessments for the study, so there was no need to obtain inter-rater reliability for the measure.

Results

Preliminary Analyses

There were considerable differences in the sample size across measurements in this study. Descriptive information regarding each measure can be seen in Table 2.

Table 2

<i>Descriptives and sample sizes</i>				
Assessment	Variable Measured	<i>N</i>	Mean	Standard Deviation
PSRA	Hot EF	49	.0066	.48479
PSRA	Cool EF	50	-.0416	.75886
STRS	Closeness	62	4.6567	.47236
STRS	Conflict	62	1.5161	.71413
CBQ	Negative	32	3.7988	.81873
	Emotionality			
CBQ	Effortful Control	32	5.6286	.53390
Total		67		

Prior to aggregating the CBQ variables comprising the negativity domain and the effortful control domain, correlations were run to determine whether correlations among items to be aggregated were sufficiently large to support aggregation. Correlations among the variables that comprise the domain score of negative emotionality are shown in Table 3. Further descriptive information regarding CBQ Negative Emotionality variables can be seen in Table 4.

Given that the variables for the domain score of negative emotionality were at least significantly correlated with one or more of the negative emotionality variables, the domain score was aggregated as suggested by prior research for the CBQ (Putnam and Rothbart, 2006).

Correlations among the effortful control variables can be seen in Table 5. Descriptive information regarding effortful control variables are shown in Table 6. As with the negative emotionality variables, the variables that make up the effortful control domain score were significantly correlated with one or more of the other effortful control variables and thus provided evidence to aggregate these variables into the domain score of effortful control as indicated in prior research for the CBQ (Putnam and Rothbart, 2006).

CBQ Negative Emotionality Variables

** . Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed).

Table 4

Descriptive Information on Negative Emotionality Variables

Variable	N	Mean	Standard Deviation
Anger	32	3.891	1.280
Discomfort	32	4.167	1.425
Fear	32	3.916	1.328
Sadness	32	4.191	.884
Soothability (R)	32	2.828	.737
Total	32		

Table 5

CBQ Effortful Control Variables

		Attention	Inhibitory control	Low intensity pleasure	Perceptual Sensitivity
Attention	Pearson Correlation Sig. (2-tailed)	1			
Inhibitory control	Pearson Correlation Sig. (2-tailed)	.646** .001	1		
Low intensity pleasure	Pearson Correlation Sig. (2-tailed)	.302 .093	.410* .020	1	
Perceptual Sensitivity	Pearson Correlation Sig. (2-tailed)	.222 .223	.361* .042	.301 .094	1

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 6

<i>Descriptive Information Effortful Control Variables</i>			
Variable	N	Mean	Standard Deviation
Attention	32	5.057	.876
Inhibitory Control	32	5.203	.826
Low Intensity Pleasure	32	6.202	.544
Perceptual Sensitivity	32	6.052	.630
Total	32		

Given that many variables comprising each of the domain scores were only correlated at a low to moderate level, Pearson correlations were also used to examine the relationships among the separate negative affective variables, the separate effortful control variables, both ‘hot’ and ‘cool’ EF, and the two teacher-child relationship variables (closeness and conflict). The anger subscale was significantly (and positively) correlated with measures of both ‘hot’ and ‘cool’ EF ($r(30) = .367, p < .05$; $r(30) = .368, p < .05$). Attention was found to be associated positively with ‘hot’ EF as well, with $r(30) = .414, p < .05$. In addition, a statistically significant relationship between hot EF and effortful control emerged, with $r(30) = .467, p < .001$. A correlation matrix was also calculated to show the relationships between variables across measures and are seen in Table 7.

Table 7

Correlations Across Measures

		Closenes s - STRS	Conflict - STRS	Cool EF- PSRA	Hot EF- PSRA	Negative Emotionalit y- CBQ	Effortful Control- CBQ
Closeness- STRS	Pearson Correlation Sig. (2- tailed)	1					
Conflict- STRS	Pearson Correlation Sig. (2- tailed)	-.206 .108	1				
Cool EF- PSRA	Pearson Correlation Sig. (2- tailed)	.132 .386	-.088 .564	1			
Hot EF- PSRA	Pearson Correlation Sig. (2- tailed)	-.058 .709	.108 .486	.146 .317	1		
Negative Emotionality- CBQ	Pearson Correlation Sig. (2- tailed)	.020 .916	-.353 .052	.182 .328	.079 .677	1	
Effortful Control- CBQ	Pearson Correlation Sig. (2- tailed)	-.080 .671	.097 .604	.092 .624	.467** .009	-.098 .593	1

**. Correlation is significant at the 0.01 level (2-tailed).

A correlation matrix was created to examine the relationships between both hot and cool EF, negative emotionality, teacher-child closeness and conflict, Childcare site (ECC or Teaching Tree) and socioeconomic status. No statistically significant relationships emerged with the exception of family socioeconomic status and childcare site, with $r(49) = -.559, p < .01$. There was no statistically significant relationship between socioeconomic status and effortful control as well. Hierarchical regression equations were calculated using the variables of interest for this study as well as indicators of socio-economic status per participant. Again, no statistically significant relationships emerged and each corresponding regression equation was not significant. The regression equation for cool EF, close teacher-child relationship, negative affect, and participant SEI is $F(4,22) = .873, p = .496$. That same regression equation used to determine effect on hot EF is $F(4,22) = .711, p = .593$. The hierarchical regression equation for cool EF with teacher-child conflict, negative affect, and SEI is $F(4,22) = 1.64, p = .199$. That same regression equation used to examine effect on hot EF is $F(4,22) = .981, p = .438$.

Data Reduction

Domain scores for negative affectivity and effortful control on the CBQ were created following results of the factor analysis of Putnam and Rothbart (2006). The domain score of negative affectivity was created by averaging the CBQ subscales of sadness, fear, anger, discomfort, and soothability. The subscale of soothability was reversed before aggregation. The domain score of effortful control was created by averaging inhibitory control, attention, low intensity pleasure, and perceptual sensitivity (Putnam and Rothbart, 2006).

The first hypothesis of this study is that children with high levels of negative emotionality will have lower levels of self-regulation behaviors. A correlation matrix was calculated to test this hypothesis with each self-regulation measure, but the results indicated there was not a

significant relationship between negative emotionality and ‘hot’ executive functioning ($r(30) = .079, p = .677$) or ‘cool’ executive functioning ($r(30) = .182, p = .328$).

Although there was not a significant correlation between negative affectivity and self-regulation, it was decided to test the remaining hypotheses, since the interaction between negative affectivity and student-teacher relationship variables still could predict self-regulation variables. Hierarchical regressions were performed to examine the second hypothesis, which is that the teacher-child relationship would act as a moderator for the relationship between negative emotionality and self-regulation behaviors. The first regression performed included the teacher-child relationship variable of closeness, negative emotionality, and the interaction between negative emotionality and closeness, and their impact on scores of ‘cool’ executive function. The closeness variable was entered first, then the variable of negative emotionality, followed by the interaction of closeness and negative emotionality. Results of this analysis were not significant, $F(3, 26) = 1.317, p = .290$. The next regression equation included the variables of negative emotionality, teacher-child conflict, and the interaction between conflict and negative emotionality. Results of this analysis also were non-significant, $F(3, 26) = 1.084, p = .373$.

The next regression examined the variables of teacher-child closeness, negative emotionality, and the interaction between closeness and negative emotionality as predictors of the variable ‘hot’ EF. Negative emotionality was entered first, followed by teacher-child closeness, and then the interaction between negative emotionality and closeness. The regression also was nonsignificant, $F(3, 25) = .096, p = .961$. Next, a hierarchical regression was computed to examine teacher-child conflict, negative emotionality, and the interaction between conflict and negative emotionality as predictors of ‘hot’ EF. This, too, was nonsignificant, $F(3,$

25) = .624, $p = .606$. Contrary to the hypotheses, none of the hierarchical multiple regression analyses performed yielded significant results.

Discussion

Analyses of the data did not support the hypothesis that individuals with higher levels of negative emotion have lower levels of self-regulation behaviors. Analyses also did not support any role of teacher-child relationship in interaction with negative affectivity as a predictor of self-regulation. One possible explanation for the lack of significant results might be that factors that were not taken into account in the current study could have been the most important influences on self-regulation and/or negativity. For example, it is possible there are differences in classroom quality and teacher engagement that may be stronger predictors of self-regulation and negative emotionality than the variables looked at in this study. In addition, each preschool classroom is comprised of different children and can lead to different dynamics in each classroom. This may also contribute to self-regulation and negative emotionality as not identified here.

It is also plausible that the peer modeling aspect of the development of self-regulation behaviors, as indicated by Raver, Garner, and Smith-Donald(2007) is a more important factor than previously thought. Perhaps instead of the teacher-child relationship acting as a moderator for the relation between negative emotionality and self-regulation behaviors, peer modeling and peer socialization account for more of the variation in self-regulation behaviors in response to negative affectivity. Since peers would be expected to more frequently show negative emotionality in front of preschool-aged children, in comparison to adults, they might be more frequent models of ways of dealing with such negative emotion. This possibility, although speculative, deserves more research..

A significant relationship was found between the behavioral assessment of ‘hot’ executive functioning and the parent-report measure of effortful control, which provides evidence for the validity of the PSRA self-regulation assessment as a measure that goes beyond the one day of observation. This correlation also provides a form of inter-observer reliability, as the ‘hot’ executive function measure was assessed by the investigator, and the measure of effortful control was based on parent report. This finding suggests that the absence of the hypothesized relations between negative affect, student-teacher relationship, and self-regulation was unlikely to be due to the lack of validity and/or reliability of the measures of self-regulation.

One possible contributor to the lack of significant results in this study is the issue of sample size. The sample size for the measure of negative affect in particular (as calculated from parent-responses on the CBQ) was very small in number and thus could possibly account for the complete lack of results supporting the hypotheses. However, in many cases, effect sizes were quite small, suggesting that unless the sample was a poor representation of the population, even a substantially larger sample would not yield significant results.

An additional plausible explanation for the study’s results is simply that there is no relationship between negative emotionality, teacher-child relationship, and self-regulation behaviors. This explanation would be inconsistent with extant empirical research on the subject using older samples, but is still a possibility. Finally, it is possible that the parent-report measures were not very accurate indicators of negative emotionality.

The small sample size, mentioned earlier, is a limitation of the study. Another limitation of the study is the lack of diversity among the sample. Although efforts were made to include a diverse sample of participants, the city in which the study was conducted has very little diversity in general. Further, the sample used in this study was mostly made up of 4-5 year old children.

Results may have been different if an equal number of 2.5 – 3 year old children were included in the sample as well.

The results of this study suggest that a reconsideration of the factors affecting the development of self-regulation during the preschool years may be warranted. One area for future research to focus on is the ways children physically modify their relations to the environment to help themselves self-regulate. During the PSRA behavioral assessment there were several instances where the investigator noticed children employing specific strategies of this sort. For example, during the Toy Wrap task, the instruction given to children was to turn their bodies away from the assessor and wait patiently and not peek until the assessor was done “wrapping” the toy. There were multiple instances (in mostly younger children) where the children took the initiative to provide themselves with environmental support so they were able to complete the task and not peek—things such as putting their heads in their hands so they can’t see, turning their body so they were facing a nearby sofa and then putting their face in the sofa cushion, and so on. This observation sparks the question as to whether these practices are typical among younger children still developing their self-regulation behaviors, and to what extent this practice either helps or hinders their development of other types of self-regulatory behaviors.

Given the results of this study, along with the knowledge that self-regulation behaviors dramatically increase in the early childhood years (Zelazo and Boseovski, 2001), it seems reasonable to postulate that there are a number of other factors influencing the development of self-regulation, such as personal characteristics or peer modeling and interactions. Future research would benefit from exploring these other various factors to identify more clearly what influences the development of self-regulation behaviors and how early childhood professionals can go about fostering this development in every child. In particular, it is plausible that peer

modeling is an important influence on the development of self-regulation behaviors, as indicated by Raver, Garner, and Smith-Donald,(2007)., Given the importance of self-regulatory processes in early development, it seems crucial for research to continue to delve into the processes associated with the development of self-regulation behaviors to better understand the complex interplay of these factors..

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